laboratory is situated about $1\frac{1}{2}$ miles from the inlet on an island.

The second spout was very interesting in as much as a hollow cone could be observed. To describe this in detail: A very slender cone descended from the general cloud mass, nearer and nearer to the waves. Then from the ocean a mist appeared, this was cylindrical in shape and of much greater diameter than the cloud mass. The conical cloud mass and the cylindrical mist met. The breaking up of the spout started with the disjunction of the cloud and mist and the absorption of the cone into the general cloud mass. After the spout broke, and as the cone ascended, protrusions formed at two points on the spout. As the phenomenon was at least 5 miles distant I could not secure more accurate information.

A few years ago a waterspout crost the harbor near the laboratory, but I was not an observer.

AUSTRALIAN WEATHER.

By DAVID J. MARES, Meteorologist. Dated Sydney, N. S. W., January 15, 1908.
[Reprinted from the Sydney Morning Herald of January 15, 1908.]

The lines drawn over the map are isobars, or lines of equal barometric pressure. The telegrams received during the course of a day by the meteorologist consist of a variety of data from the chief towns of the Commonwealth, and comprise chiefly the 9 a. m. readings of the barometer, temperature, wind, and weather. These are plotted in their respective positions on the chart, with symbols to denote the character of the wind and weather, and figures to show the readings of the barometer and temperature.

When all the barometer readings are plotted, lines are drawn through those stations reporting equal barometric pressure. Thus we obtain various shapes, and the highest values constitute the high pressure, and the lowest readings the low pressure, as shown on the weather map; an area of low pressure being always located between two highs.

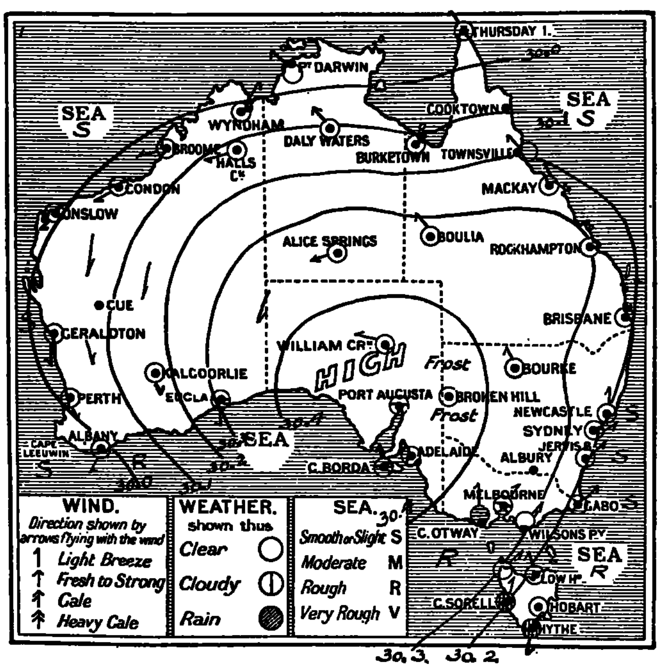

FIG. 1.—Winter anticyclones or high pressures. A type showing Australia under anticyclonic control and fine-weather conditions.

There are certain marked characteristics in these two types of pressure as regards wind and weather. In the "high" which has the greatest pressure in the center, the winds blow spirally outward, and as a rule its presence is associated with fine, dry weather in summer, and fine weather, with fogs, frosts, and dews, in winter.

The low pressures, depressions, or cyclones, as they are variously termed, are the exact converse of the "highs" as regards weather features; for whereas in the "high" the greatest readings are in the center, in the depressions the smallest readings are found there. The high pressures or

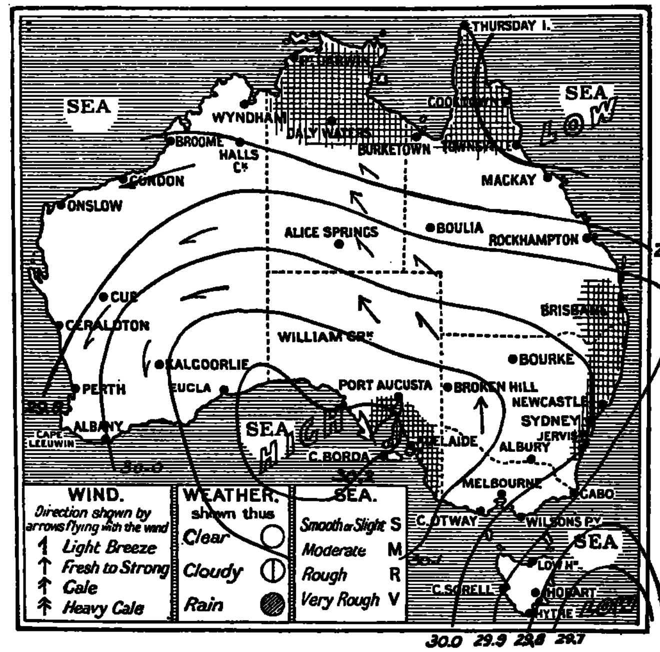

FIG. 2.—Summer anticyclones. These usually put in an appearance at about Albany, and thence travel eastward.

anticyclones, as they are sometimes termed, enter Australia on the west coast at about Geraldton in winter (see fig. 1); and on the average near Albany in the southwest in summer (see fig. 2). They travel from west to east at an average rate of about 400 miles per day, and in due course pass over the eastern coast, so that they control the weather of the land surfaces which they traverse for about five days. On rare occasions this velocity of movement exceeds 1,000 miles per day, while at other times it decreases almost to stagnation.

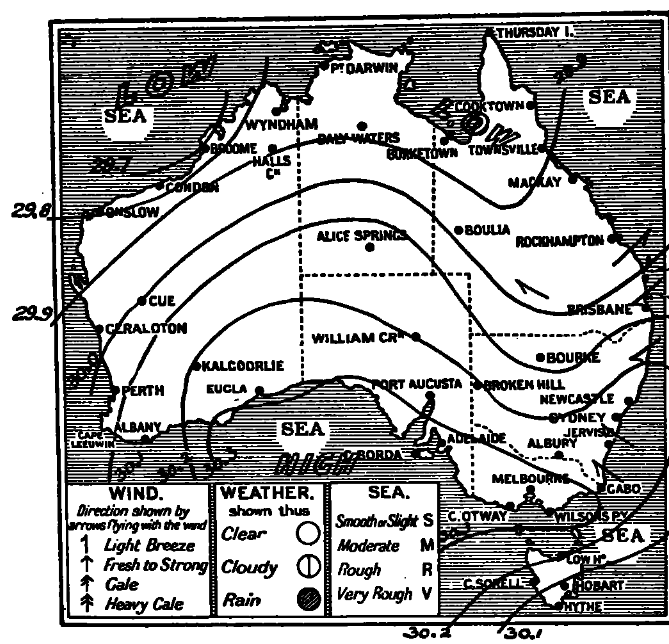

FIG. 3.—Anticyclone favoring coastal and highland rainfall. This type may be considered as a rain producer in both summer and winter.

Fine weather with cloudless skies is the almost invariable result of the influence of their presence, owing probably to the fact that the relatively high barometer readings of the center are dependent on the descent from above of cold, dry, heavy air, which is transferred over a considerable extent of country by the outward tendency of the wind. This ensures dry conditions over the area occupied by the high pressure.

An anticyclone measures in area anywhere from one to three million square miles. The winds on their northern, southern, eastern, and western sides blow from east, west, south, and north, respectively.

Under favorable circumstances, however, as when the high pressure centers are traveling along the southern coast, the advance isobars, owing to the influence they exert on the directions of the winds, favor the importation inland of moisture from the surrounding ocean. The moisture, on reaching the eastern slopes of the Great Dividing Range, is forced to ascend, and in so doing condenses into cloud and rainfall between the mountains and the coast (see figs. 2 and 3).

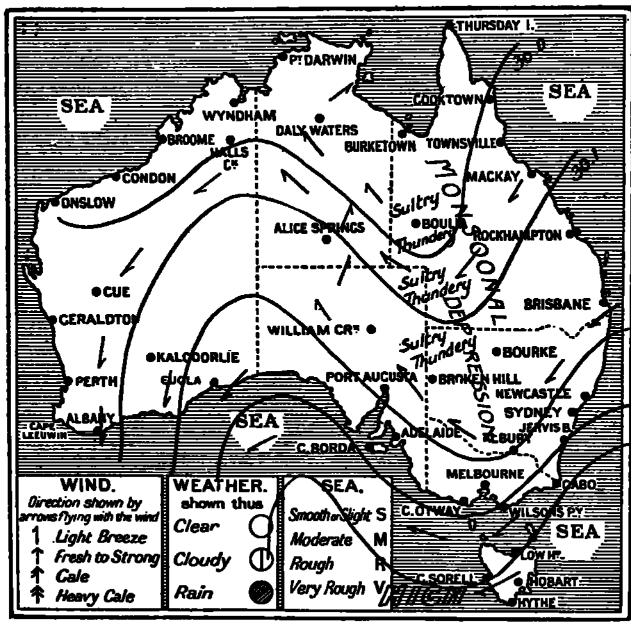

FIG. 4.—Monsoonal depression. Disturbances of this nature cause very good rains.

The low pressures peculiar to the mainland of Australia may be divided into three classes, viz, the monsoonal, Λ-shaped, and closed-curved depressions. In character they are the exact converse of the high pressure systems, the winds blowing from left to right and spirally inward to the center, which represents the lowest pressure of the atmosphere as measured by the barometer. Unlike that of the anticyclones, the weather in the center of the "low" is close, hot, and muggy, and invariably cloudy or raining. These sultry conditions favor strong ascensional currents into the higher regions of the atmosphere, which upon cooling down with altitude condenses into cloud, which is precipitated as rainfall.

From September to April some of the best rainfalls experienced in New South Wales are the products of depressions chiefly of monsoonal origin (see fig. 4). These first put in an appearance in the northern part of Central Australia, and extend gradually southward, causing extensive and beneficial rains. Thunder also is another very frequent occurrence.

The second class of depression is the Λ-shaped which is an intrusive low pressure peculiar to the southern portion of the continent between two high pressures. This type (see fig. 5) is not essentially a rain developer, owing to its shape, which is open on the southern part. The winds on the eastern or advancing side are from the northwest; in summer, the hot, dusty, dry northwesters so often experienced in New South Wales. On the western side of this depression is the cool, welcome southerly "burster." This explains the reason why a hot northerly wind is so quickly followed by a cool southerly. For as soon as the center of the Λ passes a certain point the wind from an opposite direction is experienced.

The third depression (see fig. 8) is the closed curve, of cyclonic nature. Its shape is annular or rounded, the winds as a rule being very violent, and, as it passes over the seaboard, proves very dangerous to shipping, for it very soon lashes up the sea with its hurricane-like easterly squalls. The directions of the winds on its northern, southern, eastern, and western sides are west, east, north, and south, respectively. Very heavy rains are, as a rule, experienced with this class of disturbance, and certain types of this order of low pressure are quite destructive, but fortunately their appearance is very rare.

The following detailed explanation of the accompanying charts will prove helpful:

A winter anticyclone, fig. 1, has been described in the foregoing as making its first appearance on the western shores of Australia, at about Geraldton, thence traveling eastward over the mainland at a variable rate, but averaging about 400 miles per day. As a further explanation, it should be stated that the shape of the anticyclone over the comparatively flat lands of the continent is an ellipse, with axes in the ratio of two to one, the longer axis being east and west. This shape is somewhat modified when the high pressure reaches the Great Dividing Range, the result being a deflection of the whole anticyclone to the north. The usual weather conditions associated with it are fine during the day, with early morning frosts and fogs. Figure 1 shows an illustration of an anticyclone, which, owing to the disposition and extent of its isobars, controlled the weather of the whole continent.

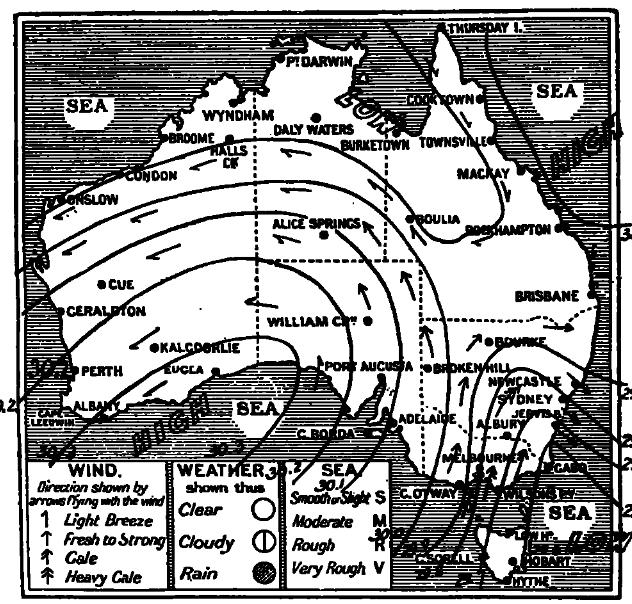

FIG. 5.—Λ-shaped depression. Showing the frontal portion of the Λ responsible for the hot nor'-westers, passing off the coast of New South Wales, and the southerly gale, or "burster," which is imminent, approaching the seaboard.

Figure 2 is a type of the summer anticyclone. The high pressure, peculiar to the summer months, travels in higher latitudes, or farther south, than that of winter, the variation in latitude being influenced by the migrations of the sun. On the average, they first put in an appearance at about Albany, W. A., and thence travel eastward, but do not control our weather to such an extent as the winter types, for their more southern latitude induces the development of the monsoonal disturbances to the north. The winds on the eastern or advance side of this high pressure are from the south, and on the western limits blow from the north.

Figure 3 is a representation of another anticyclone, but with opposite weather characteristics, which are probably due, in addition to its comparatively high or southern latitude of

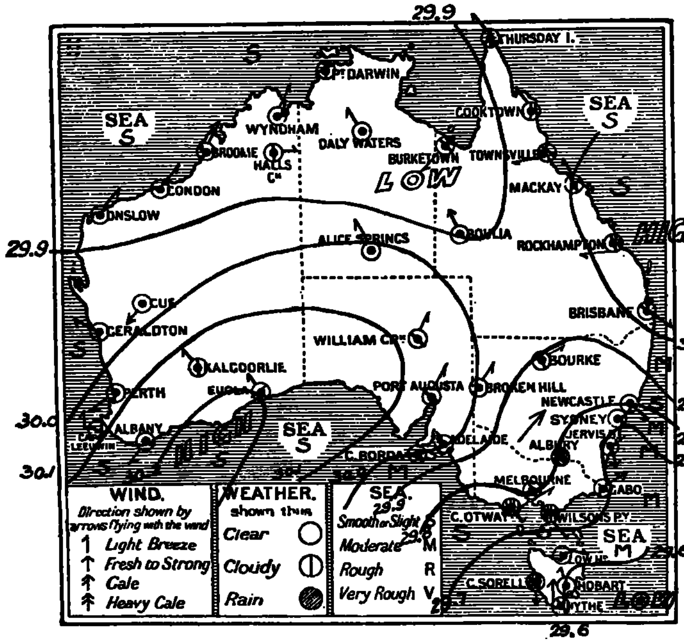

FIG. 6.—Square or double-headed depression. This type is responsible for development of thunder and hail conditions.

travel, to the peculiar distribution of its isobars. These are so situated as to influence the sea breezes to blow toward our eastern slopes, where their moisture is precipitated as rainfall.

As shown in fig. 4, a monsoonal depression covers the whole of the eastern States, with its isobars so arranged as to influence the importation inland of moisture from the ocean on the east. In each case—from the isobar of 30.00 inches to that of 30.4 inches—the winds are from the northeast, east, and southeast in the depression, which acts in the capacity of a basin, and collects the moisture thus brought in. This moisture is essential to the development of thunder and rainfall. Disturbances of this nature cause very good beneficial rains which are occasionally distributed over the entire State, particularly between the months of September and April.

Λ-SHAPED DEPRESSION.

The Λ-shaped depression mentioned in the foregoing is formed between two high pressures. A good example of one is shown in fig. 5. The winds associated with this class of low pressure are worthy of remark, for near the apex of the Λ a very narrow division exists between the hot nor'-wester, on its eastern side (which in this instance is just passing seaward), and the cool southerly burster on the western side. A glance at the figure will show this very clearly. Under certain conditions, although not essentially a rain producer, some fairly good rains from the thunderstorms may be occasioned by a Λ; for the region between two high pressures is, as a rule, associated with thundery conditions, which are at times accentuated by the proximity of the depression.

The isobaric contour shown in fig. 6, represents to the forecaster a very reliable indication of thunder and hailstorms. It is really a subtype of the Λ depression, and, owing to its shape, is styled "square or double-headed." This peculiar formation is due to the expansion of the apex of the Λ. Probably this results from the geographical features between South Australia and our southeast coast, as also from the fact that during the previous day the outer isobar extended into very low latitudes, thus favoring the transportation southward by its northerly winds, of the sultry, unsettled conditions which obtained in the northern part of Central Australia. These conditions become the dominant weather features about the central area of the depression, and result in both thunder and hail over many parts of the state. The pressure distribution, as shown in fig. 6, is identical with that on the weather maps of November 23 and 26, 1907, and caused the phenomenally heavy thunder and hailstorms on those dates.

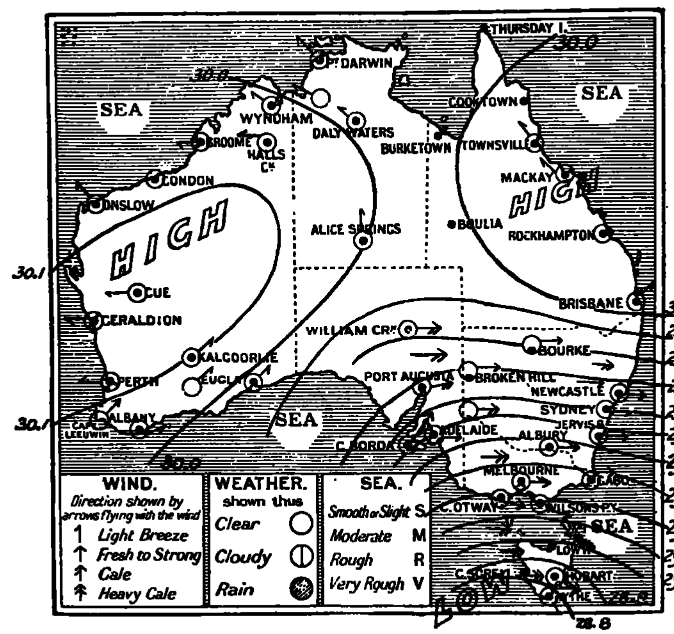

FIG. 7.—Westerly gales. This type, generally responsible for westerly gales over a great expanse of country, occurs chiefly in the winter months.

The subtype which is generally responsible for westerly gales over a great expanse of country, is shown in fig. 7. It occurs chiefly in the winter months.

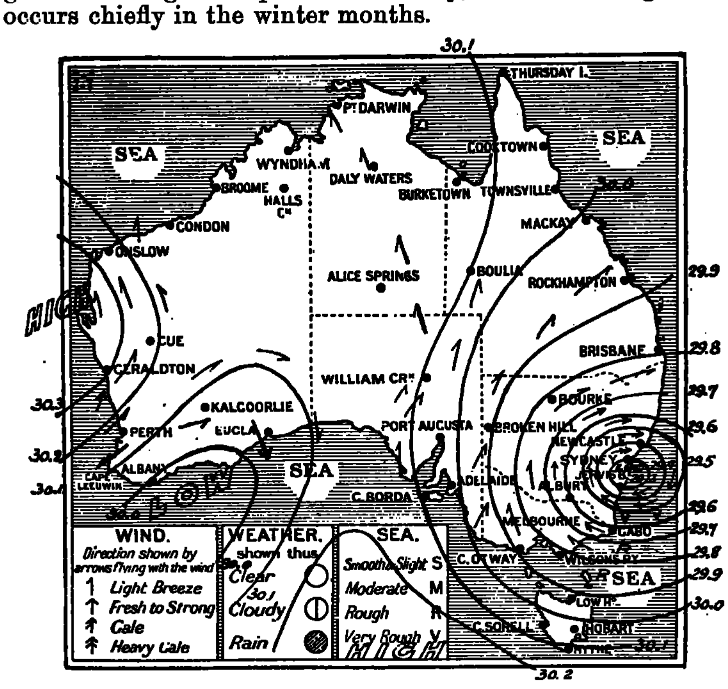

FIG. 8.—A cyclonic disturbance. This type shows an energetic cyclonic disturbance situated over the eastern States, with its center (29.3) between Jervis Bay and Sydney.

In this example the Λ flattens out considerably, until its isobars run almost east and west, and crowd together, making the barometric gradient very steep. Sometimes between the lowest and the highest readings there is a range in pressure of upward of 1 inch in about 1,000 miles, which causes very heavy westerly gales over the country covered by the low pressure, especially near the area of lowest barometric readings. With a disturbance of this description, light to heavy general rains are experienced over South Australia, Victoria, and the southern half of New South Wales.

Figure 8, shows a remarkable distribution of pressure in New South Wales, with a central barometric value of 29.3 inches, and its surrounding isobars very closely arranged; thus causing very steep gradients and, consequently, violent winds round the vortex of the disturbance. The circulation of the wind is clockwise, the directions being west on the northern, north on the eastern, east on the southern, and southerly on its western limits. This is popularly known as a "cyclone", and the violence of the winds is perilous to shipping, especially the easterly element, which, as the storm is leaving a coast line, as shown on the chart, causes very rough and dangerous seas. Some very heavy rains occur over the area occupied by the cyclone, at times causing floods in low lying lands. These cyclonic storms are very seldom experienced in Australia. On rare occasions, however, they are formed at the southern extremity of a monsoonal tongue, and now and then a roving "cyclone" may work southward from the Tropics, to Rockhampton or Brisbane. In the latter case their appearance would be almost unheralded, until the strong southerly and easterly gales of the western side are in full swing.

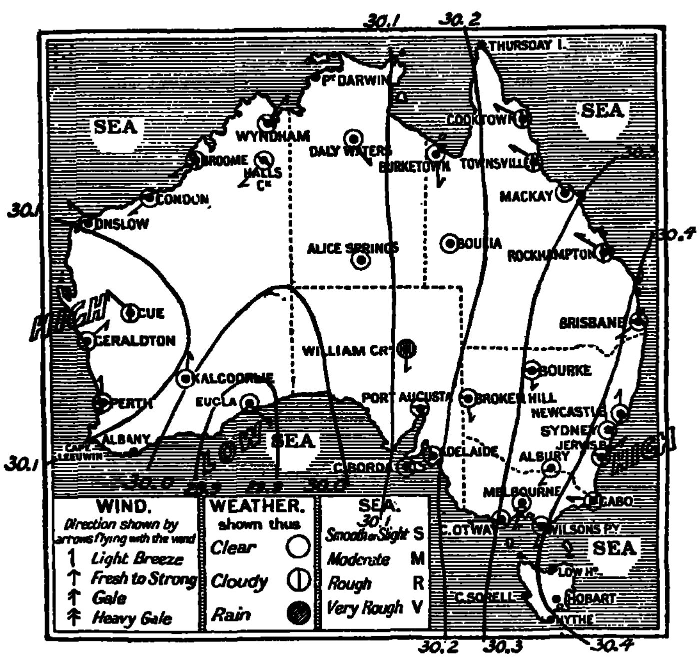

Fig. 9.—Vertical or straight line isobars. These isobars over the eastern states, closely followed by a Λ-shaped depression, sometimes result in good general rains over the southeastern states within forty-eight hours.

Figure 9, presents a class of pressure distribution which is not often met with, but when it exists, as here shown, sometimes results in good general rains within forty-eight hours over the southeastern states. The north-south isobars are the rear of a departing high pressure, and the wind circulation is responsible for the inflow to the heart of the continent, of tropical moisture which, upon being met by the cool southerly wind of the Λ-shaped depression, is precipitated as rainfall. These resulting rains occur first in the northwest of our state, thence extend eastward and finally westward.

NOTES FROM THE WEATHER BUREAU LIBRARY.

By C. FITZHUGH TALMAN, Librarian.

INAUGURATION OF THE LAKE CONSTANCE KITE STATION.

Altho regular observations were begun at the Lake Constance kite station on April 1, 1908 (see MONTHLY WEATHER REVIEW, February, 1908, p. 21, and April, 1908, p. 110), the formal inauguration of the building took place July 11, in the presence of the King of Württemberg, representatives of the German Empire, Baden, Bavaria and Alsace-Lorraine, the governing board of the institution, and certain members of the International Committee on Scientific Aeronautics. This event has attracted much attention to the new station, descriptions of which have lately appeared in many of the European newspapers, and popular illustrated weeklies, as well as in the scientific press.

The institution owes its origin chiefly to Professor Hergesell, of Strassburg, president of the International Committee on Scientific Aeronautics. As early as 1900 Professor Hergesell made experimental kite flights over Lake Constance, in collaboration with Count Zeppelin; and having assured himself that this lake was especially well suited for the operations of a kite boat he brought the matter to the attention of the German Imperial and State governments, and succeeded in obtaining the necessary appropriations for the establishment and maintenance of the station.

The little steamer *Gna*, from which the kites are flown, resembles a torpedo boat and has a maximum speed of 19½ knots. The kites are launched from the masthead, and are generally flown tandem. It is said that the four members of the crew are becoming quite expert in the difficult and unique task of adapting the speed and direction of their vessel to the vagaries of the wind.

DOCTOR POLIS'S SECOND VISIT TO AMERICA.

Dr. P. Polis, Director of the Meteorological Observatory of Aachen, Germany, arrived in New York on the *Kaiserin Auguste Victoria* August 15, and sailed for Germany on the same steamer August 20. Doctor Polis's trip was undertaken at the invitation of the Hamburg-American Line, in order that he might make experimental daily weather maps of the transatlantic steamship route, based on wireless reports from steamers and land stations. A report of the results of the journey will be made to the German Government.

METEOROLOGY IN BRITISH NORTH BORNEO.

We are indebted to Mr. Lester Maynard, American Consul at Sandakan, British North Borneo, for an extract from the British North Borneo Herald of July 1, 1908, regarding the meteorological work that is now carried on in that country under the supervision of the principal medical officer. It appears that the latter official has just published a small pamphlet, not intended for general circulation, containing the somewhat imperfect results of the observations made at all stations during 1906 and 1907, which is believed to be "the first attempt to collate the meteorological returns of the various stations in North Borneo."

To the following abstract of the annual rainfall is attached the query: "Is Tawao the Sahara of British North Borneo, or is it only the result of a leaky rain-gage?"

TABLE 1.—*Annual rainfall in British North Borneo, 1906–7.*

	1906.	1907.
	Inches.	*Inches.*
Sandakan	84.48	153.74
Kudat	64.16	101.70
Taratipan (near Kudat)	99.14	104.59
Jesselton	94.63	101.96
Beaufort	158.09	(?) 62.91
British Borneo Para Rubber Co., Beaufort	159.03	168.64
Sapong Estate	64.80	57.10
Tawao	28.33	26.39